

Remarks

This Amendment is submitted in response to the Office Action dated April 19, 2000. Claims 1 and 51 were amended. Accordingly, claim 1-8, 51, and 52 are pending. No new matter has been added.

Rejection under 35 U.S.C. §112, second paragraph

Claims 1-8, 51, and 52 were rejected under 35 U.S.C. §112, second paragraph, because it was allegedly difficult to discern what comprises SiO₂, etc. Claim 1 has been amended to indicate that the recited particles have the recited composition. Claim 51 was rejected because of the term "at least about 90%". The Applicant submits that this claim term is understandable as written; however, to facilitate prosecution, the Applicant has amended claim 51 to remove "about". Claim 52 was rejected for the use of the term "HV" when describing hardness. The Applicant submits that the term "HV" indicates that the hardness measurement is a Vickers hardness number. Enclosed with this Amendment and Response is a copy of page 133 from Callister, Materials Science and Engineering: An Introduction (4th ed.) (1997), a textbook in the field of Materials Science, which demonstrates the standard usage of this term. The Applicant requests withdrawal of this rejection.

Rejection under 35 U.S.C. §102 and §103

Claims 1-4, 6-8, and 52 were rejected under 35 U.S.C. §102(b) as being anticipated by Hnat et al., 9th International Ash Use Symposium, pp. 74-1 to 74-13, (hereinafter "Hnat"). Claim 5 was rejected under 35 U.S.C. §103(a) as being unpatentable over Hnat, further in view of UK Patent Application No. 2176774A to Toussaint (hereinafter "Toussaint"). The Applicants traverse this rejection for the reasons set forth below.

Hnat discloses a method for making mineral wool from metal processing slag. During the fiberizing process, up to 50% of the material forms into "shot", which is described as small

spheres less than 300 microns in diameter. This "shot" is removed in collection screens and discarded as waste.

Toussaint discloses the use of unrefined or refined glass to form vitreous beads.

Neither of these references teaches or suggests the formation of a composition comprising particles formed using coal slag or coal fly ash, where at least 50% of the particles are substantially spheroidal. Toussaint does not teach or suggest the use of coal slag or coal fly ash for forming particles.

Hnat teaches the formation of particles from metal processing slag while preparing mineral wool. These particles are discarded as waste. In the process of mineral wool formation, slag particles are fed into a device that draws fibers out of the slag particles. The "shot" is particles from which the fibers have not been drawn or only partially drawn. Many of the "shot" particles have tails or partially formed fibers extending from the particles. Other "shot" particles have fibers that have partially or fully fused to the surface of the particles. The majority of the particles are not substantially spheroidal. The non-spheroidal nature of the majority of the "shot" particles is a result of the manufacturing process for mineral wool.

To demonstrate the type of shot obtained from the mineral wool manufacturing process, the Applicant obtained a quantity of shot and observed the shot under an SEM as described in the Declaration of Paul W. Meyer. Five SEM photographs of the shot are attached as Exhibits A-E to the Declaration of Paul W. Meyer. As illustrated in these photographs, most of the particles are non-spheroidal as would be expected based on the method of manufacture, as described above. Many of the particles are irregular or roughly cylindrical in shape. Thus, the material described in Hnat does not anticipate the Applicant's claimed compositions. The shot is not sufficiently spheroidal.

In contrast to the cited references, the Applicant has invented a process that permits the manufacture of the inventive compositions claimed in claims 1-8, 51, and 52, where, as recited, at least 50% of the particles of the composition are spheroidal. In some instances, as disclosed in Example 1 of the specification, at least about 90% of the particles are spheroidal. The spheroidal nature of the particles is particularly important in applications such as, for example, shot peening. A composition having a majority of non-spheroidal particles would typically not be acceptable

applications such as, for example, shot peening. A composition having a majority of non-spheroidal particles would typically not be acceptable for this and other applications. The "shot" generated by the mineral wool manufacturing process does not meet the limitations of the Applicant's claims. Thus, Hnat does not teach or suggest a method for the manufacture of the Applicant's claimed composition.

Because none of the references teach or suggest the Applicant's claimed compositions, the Applicant submits that claims 1-8, 51, and 52 are patentable over the cited references. The Applicant respectfully requests that the rejection of these claims be withdrawn.

Conclusion

In view of the amendments to the claims and the arguments presented herein, the Applicant respectfully submits that each of the presently pending claims (claims 1-8, 51, and 52) is in condition for allowance and notification to that effect is respectfully requested. The Examiner is invited to contact Applicant's representative at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

Respectfully submitted,

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FOURTH EDITION

Materials Science and Engineering

An Introduction

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Back Cover: Top view of the $\text{YBa}_2\text{Cu}_3\text{O}_7$ unit cell that is shown on the front cover.

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Table 6.5a Rockwell Hardness Scales

<i>Scale Symbol</i>	<i>Indenter</i>	<i>Major Load (kg)</i>
A	Diamond	60
B	$\frac{1}{16}$ in. ball	100
C	Diamond	150
D	Diamond	100
E	$\frac{1}{8}$ in. ball	100
F	$\frac{1}{16}$ in. ball	60
G	$\frac{1}{8}$ in. ball	150
H	$\frac{1}{8}$ in. ball	60
K	$\frac{1}{8}$ in. ball	150

Table 6.5b Superficial Rockwell Hardness Scales

<i>Scale Symbol</i>	<i>Indenter</i>	<i>Major Load (kg)</i>
15N	Diamond	15
30N	Diamond	30
45N	Diamond	45
15T	$\frac{1}{16}$ in. ball	15
30T	$\frac{1}{16}$ in. ball	30
45T	$\frac{1}{16}$ in. ball	45
15W	$\frac{1}{8}$ in. ball	15
30W	$\frac{1}{8}$ in. ball	30
45W	$\frac{1}{8}$ in. ball	45

the eyepiece. The measured diameter is then converted to the appropriate HB number using a chart; only one scale is employed with this technique.

Maximum specimen thickness as well as indentation position (relative to specimen edges) and minimum indentation spacing requirements are the same as for Rockwell tests. In addition, a well-defined indentation is required; this necessitates a smooth flat surface in which the indentation is made.

KNOOP AND VICKERS MICROHARDNESS TESTS¹⁴

Two other hardness testing techniques are Knoop (pronounced *nūp*) and Vickers (sometimes also called diamond pyramid). For each test a very small diamond indenter having pyramidal geometry is forced into the surface of the specimen. Applied loads are much smaller than for Rockwell and Brinell, ranging between 1 and 1000 g. The resulting impression is observed under a microscope and measured; this measurement is then converted into a hardness number (Table 6.4). Careful specimen surface preparation (grinding and polishing) may be necessary to ensure a well-defined indentation that may be accurately measured. The Knoop and Vickers hardness numbers are designated by HK and HV, respectively,¹⁵ and hardness scales for both techniques are approximately equivalent. Knoop and Vickers are referred to as microhardness testing methods on the basis of load and indenter size. Both are well suited for measuring the hardness of small, selected specimen regions; furthermore, Knoop is used for testing brittle materials such as ceramics.

¹⁴ ASTM Standard E 92, "Standard Test Method for Vickers Hardness of Metallic Materials," and ASTM Standard E 384, "Standard Test for Microhardness of Materials."

¹⁵ Sometimes KHN and VHN are used to denote Knoop and Vickers hardness numbers, respectively.